

ALLEN, (J. G.)

REPRINT FROM THE MEDICAL BULLETIN.

ORTHOPÆDIC NOTES;

—WITH—

REPORT OF INTERESTING CASES

TREATED AT THE

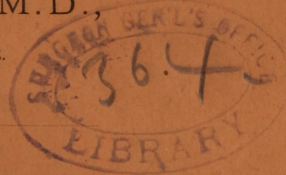
SURGICAL INSTITUTE,

NORTHEAST CORNER BROAD AND ARCH STREETS, PHILADELPHIA.

BY

J. G. ALLEN, M.D.,

SURGEON IN CHARGE.



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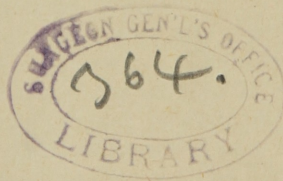
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Orthopædic Notes.



ORTHOPÆDIC NOTES;

WITH REPORT OF INTERESTING CASES

TREATED AT THE SURGICAL INSTITUTE, N. E. CORNER OF BROAD AND ARCH STREETS, PHILADELPHIA, PA.

By J. G. ALLEN, M.D., Surgeon in Charge.

THERE is nothing that is more frequently neglected and misunderstood, both by physicians and patients, than the use of braces as artificial supports, or mechanical appliances designed for correcting deformities. Such apparatus, in almost all cases, requires continual attention; generally little alterations, which perhaps on each occasion may seem petty, but the aggregate of which is momentous. The correction of deformities is at best a slow and tedious process; whatever is gained, is only gained little by little, and it is in the highest degree unphilosophical to apply an apparatus that will correct a fraction of a deformity, and omit to follow it up by daily efforts to gain new fractions and make secure all that is thus gained. So, also, is it to refer a patient with a deformity (as is often done) to a workman merely skilled in the art of manufacturing the instrument to be worn, but totally ignorant of the more important anatomical knowledge which is absolutely necessary for the proper and efficient adjustment and regulation of any mechanico-surgical appliance. Just as well might a surgeon refer a patient with a broken limb to a carpenter or splint-maker, as to refer a case of deformity to an orthopedical instrument maker, no matter what may be his skill as an artisan,—just as well might the surgeon omit to watch and alter, to refit and replace the splint dressings of a broken limb, as to omit these same points in managing the mechanical appliances used for correcting deformities.

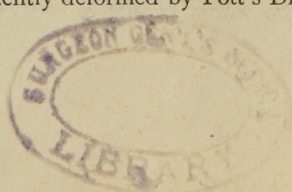
It is a conviction of the importance of this matter of bringing the skilled workmanship of the mechanic fully and completely under the immediate control of the surgeon, and of having it constantly at hand for instant service, even with the tools that the surgeon may sometimes wish to participate in using,—a conviction confirmed by much observation and experience,—that impels the writer to bring to the notice of the profession at large some of the new and improved methods used at the Surgical Institute in Philadelphia, Pa., for the treatment of that large class of cases which are so often wholly unmanageable in private practice, because of the absence of the proper mechanical appliances.

The importance of mechanical exercises as a

means of cure is now generally recognized. It has had many drawbacks in the course of its development to its present accepted position; but now, happily, the ridiculous assumptions of bone-setters and pretentious manipulators have had their day. The classes of cases likely to derive benefit from this method of treatment are becoming well known and well defined, though the full benefits are as yet reaped only by a few.

It is estimated that there are at this time 30,000 persons in the United States whose only means of locomotion is the rolling-chair. Of course, a large majority of these are cases of paraplegia and kindred forms of paralysis, utterly hopeless and incurable; but it is sad and pitiable to reflect that perhaps 10,000 of them are really wasting their lives, being merely the victims of rheumatic arthritis, or some form of muscular rigidity that is often amenable to mechanical treatment. Systematic massage, in connection with other rational methods of passive movements, would renew the function of their muscles again, and restore to these unfortunates in various degrees the use of their limbs once more. Yet, often for twenty, thirty, or forty years,—a lifetime,—they sit helplessly, hopelessly, and sadly in their rolling chairs, because they know not that there is even a hope of possible relief, and because the methods of cure are such that it is impossible for each individual practitioner to use and apply them.

So, indeed, is it with nearly every kind of human deformity. The proper means and methods of cure are peculiar, and require continuous and peculiar attention; and the cases, though in the aggregate very numerous, are so scattered and isolated that it is utterly impracticable for each individual practitioner to provide and maintain the necessary appliances for treating them. For these reasons, and from the circumstance of their isolation, they become neglected until many a permanent and shocking deformity results in cases for which a method of cure is well known, especially if applied at the time of its earliest manifestation. As an illustration, there are thousands of individuals permanently deformed by Pott's Disease of the



Spine,—often sensitive and cultured persons, —with monstrous and unsightly humps on their backs, daily suffering a mental martyrdom from their deformity, yet proper mechanical support, applied in the early stage of the disease and sufficiently persevered in, might have saved nearly all of them with a deformity so small as to pass almost unnoticed. Lateral Curvature, an opprobrium of surgery, is very amenable to a treatment combining mechanical supports and special exercises, if promptly resorted to during the growing period of youth, the time when it most frequently originates; yet it is generally neglected till adult age has fixed the deformity beyond relief, or till such a condition has resulted that a mere arrest of the disease is all that is possible, and oftentimes even this much cannot be assured in badly neglected cases.

During the past three years 1186 cases have been under treatment. A very large proportion of these cases were of this character.

Thus 948 of them required braces or special mechanical appliances of some form to be worn by the patient. Of these, 820 required other mechanical treatment, electricity, massage, or some kind of passive exercise. In very few of these cases could these methods of treatment have been satisfactorily managed by physicians occupied with general and miscellaneous practice.

In order to properly understand the treatment of the cases reported it will be necessary to give a brief description of some of the appliances used at the Institute. In the report of cases which is to follow, noticeable departures from the ordinary treatment will be noticed in the management of club feet, Pott's disease, infantile and other forms of paralysis, etc., the details of which will be minutely described, though a perfectly clear description of the machinery by cuts and drawings is almost impossible, as it requires a personal examination to understand and appreciate it.

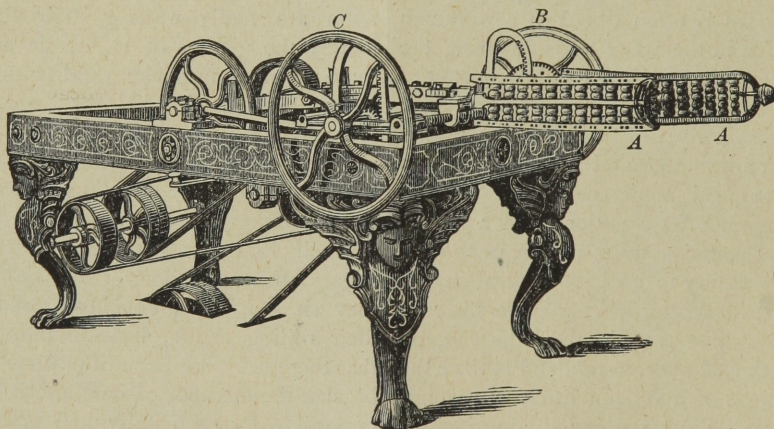


FIG. 1.

Fig. 1 represents a most important massage apparatus, sometimes spoken of as a "body kneader." It has two adjustable projecting arms, *AA*, upon which are arranged hundreds of elastic rubber rollers or balls, each ball revolving on a shaft. The patient is seated on a stool or divan, so as to bring the body conveniently between these projecting arms which, though moving with exceeding rapidity, are so perfectly adjustable that every part of the torso can receive a most thorough massage. It is a very important and useful machine as an adjunct in the treatment of torpid liver, dyspepsia, constipation, and many forms of nervous disease; also for a large class of patients who either cannot or will not take

sufficient exercise. By the combined operation of this machine upon the torso, and of another machine (to be described later) upon the limbs, the whole body can be most thoroughly and completely kneaded and manipulated. These massage operations are very much more thorough and complete than anything possible by hand manipulation.

Graham, in urging the proper performance of this operation, says, "The means employed cannot be too carefully selected, especially when it is a question of such potent means as massage, which affects either directly or indirectly, every function of the human body.

"This is an art which does not mend nature,
But the art itself is nature."

In cases of general muscular debility, which are accompanied by torpid liver, constipated bowels, a general feeling of *malaise*, and the train of evils following in the wake of atonic dyspepsia, the most brilliant results are obtainable from the use of the massage apparatus described as Fig. 1. This is exactly what should be expected when we remember that by muscular activity in health every portion of the human body is receiving a kneading more or less vigorous. Thus the movements of the diaphragm, by its ascent and descent, keep up a sort of massage on the organs above and below it, while the voluntary muscles throughout the entire body are continually kneading and compressing themselves and each other by their constant contraction and relaxation. Thus to imitate the processes of nature herself is the true method of treatment to be employed in cases where atony and general debility are the ruling symptoms.

The most rational treatment is that which restores the normal life processes, not attempting to drive exhausted organs to their work, but to assist them. The voluntary muscles receive normally one-fourth the entire amount of the blood in the body, and by their constant and vigorous movements it is aided in returning to the heart, after nourishing the parts through which it circulates; but when the muscles are inactive the circulation becomes retarded, the parts enfeebled, the muscles more or less atrophied from disuse, until finally even the blood itself deteriorates in quality. Here, again, the cause of the trouble incident to the enfeeblement of the muscular system suggests the remedy, and when enfeebled organs are unequal to the task of their own repair, the skill and judgment of the surgeon should be expended in following the indications pointed out by nature's methods. When the muscular system is in a healthy condition active exercise will remove the trouble, when it is not, the rational treatment is to imitate nature, for which no better means than massage are known; and this, to be effective, must be prolonged and thorough and must include the manipulation of the entire body.

The machine described as Fig. 1 will thoroughly exercise the entire torso. Fig. 2 represents a most useful and thorough massage apparatus for the limbs.

To use it for the lower limbs the patient occupies the seat *A*, which slides to and fro by

means of the wheel *A*, the leg passing between the adjustable upright arms *C C*. These arms move up and down very rapidly, carrying a great number of elastic rubber roller balls which press upon and rub the limb with astonishing precision and thoroughness. By seating the patient on a chair, or stool at the foot of the machine the arm can be treated in like manner. It will accomplish as much as eight or ten machines of the patterns used in the Swedish movement cure at Stockholm. It reverses about two hundred times a minute; the rubber rollers thoroughly kneading the muscles without discomfort or pain. Appropriately used, it greatly increases the development of enfeebled, atrophied, or paralyzed muscles, and is almost indispensable in the treatment of stiffened joints, muscular rigidity, and all forms of lameness of rheumatic origin.

By the use of these two machines massage of the entire body can be performed much more thoroughly than by hand, and the most gratifying results are constantly being obtained, as shown by the following cases:—

Case I.—Mr. H., a college professor, aged fifty-one years, came to the Institute utterly run down mentally and physically, much emaciated, suffering from atonic dyspepsia, torpidity of liver and bowels, obstinate constipation—the bowels never being evacuated naturally, and requiring the constant use of both purgatives and enema—skin sallow, eyes sunken, depressed in spirits, rendering him unable to continue his work. He had exhausted all known remedies used in such cases and had consulted without avail eminent physicians whose specialties were the treatment of such disorders as he was suffering from. He was under treatment here about three months. The treatment was principally massage and friction over the region of the liver and abdomen by means of “body kneader” (Fig. 1) and the free use of the limb kneader (Fig. 2), thus giving a very complete massage to the whole body. The flagellator and compound gymnasium, hereafter to be described, were also occasionally used as adjuncts to the treatment. A marked improvement became apparent in a few weeks, and three months' treatment completely restored his health. His natural courage and vivacity returned, his bowels acted normally without any medicine, his skin assumed its proper hue, and he has been for a year past able to continue his work

(which often occupies him from 7 A.M. to 10 P.M.) with complete satisfaction, comfort, and success. To use his own statement on a recent visit to the Institute, he has become a "new man."

Case II.—Miss B., aged thirty, deplorable case of dyspepsia with great nervous depression, constipation, torpid liver, sallow complexion, appetite irregular and erratic, headache, painful and scanty menstruation. No local treatment was resorted to for the uterine trouble, no cathartics or laxatives were given for the condition of the liver and bowels except for the first eight or ten days, the treatment being wholly such as described in preceding case. The menstrual trouble was very greatly relieved, the constipation entirely cured, the appetite became regular, she improved in

flesh, and regained her courage and spirits, and left the Institute after two months treatment, considering herself entirely well.

Case III.—Miss S., aged twenty-four, dyspepsia with marked torpidity of liver and bowels, constipation obstinate, and menstruation irregular, complexion sallow, appetite poor and irregular, constant dull headache, spirits depressed, shunning company, and exhibiting the whole train of symptoms so common in cases of dyspepsia and uterine disorders. Two months' treatment of body and limbs with massage by machinery described, together with daily exercises with compound gymnasium and electricity improved her to such a degree that she declared herself cured.

Case IV.—Mr. W., aged thirty-six, insurance

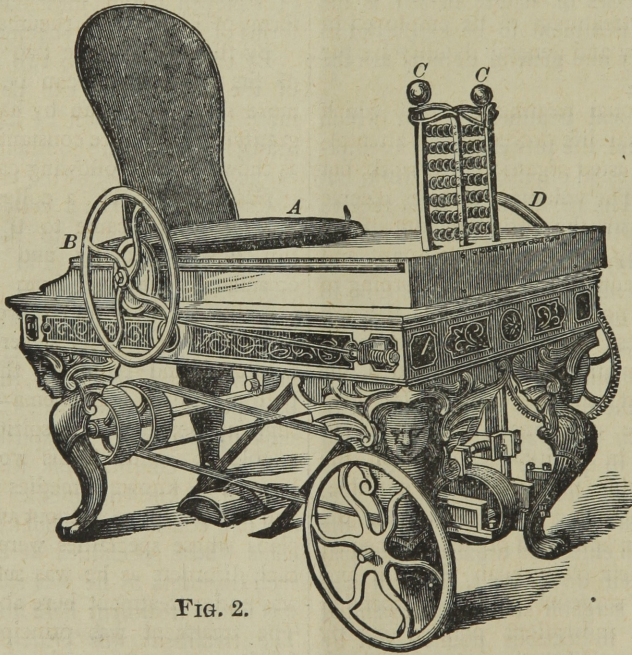


FIG. 2.

agent, had been intensely occupied with intricate and exacting business, which had resulted in a complete breakdown of the nervous system. He was weak and emaciated, and his stomach so irritable that he was unable to eat the most digestible articles of food without genuine or imaginary pain and suffering; the bowels were sometimes constipated, whilst at other times he had diarrhoea with colicky or crampy pains. He had become almost an insane hypochondriac. After he became able to go out of the house, which he did at the end of one month's treatment, he could walk over the plain pavement between streets, but imagined himself

unable to cross a street without assistance. After five months' treatment with general massage, Franklinic electricity, and the simplest tonics, he was able to return to his business and has been able to continue at his desk ever since.

After a considerable degree of improvement has occurred from the use of massage in the class of cases just described, or where the depressed condition is not brought on by overwork, or is not one of true exhaustion, very great advantage can be had from the use of Eugene Pau's well-known compound gymnasium (Fig. 3), with which the Institute is provided.

No mistake, however, is much more frequently made by physicians than the attempt to require active or gymnastic exercises from exhausted patients, before they have been sufficiently rested and restored by other methods and measures of treatment, to be able to endure it. It is the large class of patients that are thus unable for any form of gymnastics, and yet need exercise, that the massage apparatus just described is of so much im-

portance and value in treating. There are also certain forms of paralysis which, like these exhausted cases, are utterly unable for any kind of active exercise, for which there is no possible treatment comparable to active, thorough, and prolonged massage, such as can be administered by apparatuses Figs. 1 and 2, and when the skin is cold and insensitive, as it generally is in connection with muscular weakness and paralysis, the flagellating

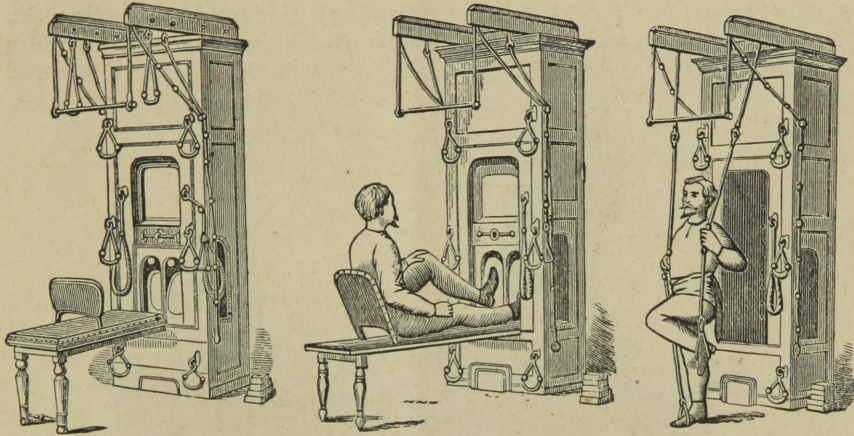


FIG. 3.

apparatuses, Figs. 4 and 5, are almost indispensable. Fig. 4 consists of a bench or table through and above which a rapidly revolving shaft *A*, projects; to this shaft are

attached several soft leather straps *B*, *C*, *D*, *E*. As the shaft revolves these become gentle but efficient flagellators; whose operation stimulates the capillary circulation of the

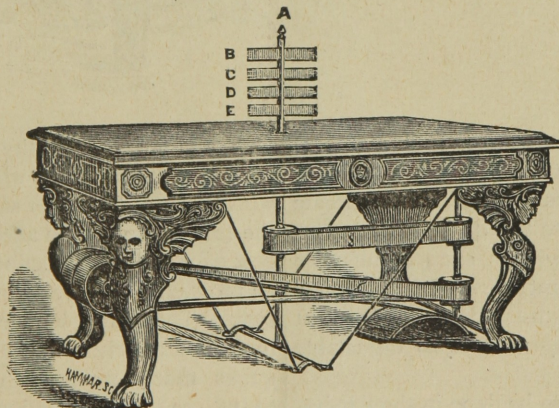


FIG. 4.

skin in a most satisfactory manner. The patient can be seated upon the bench so as to receive the flagellation on any and every part of the torso.

Fig. 5 operates similarly to Fig. 4. The patient is placed upon the seat *A*, which moves to and fro as in Fig. 2; the lower limb is placed between the two upright revolving shafts

C, D, which being set in motion the projecting leather straps *E, E*, flagellate and stimulate the limb very effectually. By placing the patient on a seat at the end of the machine, the arm can be operated upon in the same manner. Thus by the combined operation of these various machines, the whole, or any desired portion of the body can be most thoroughly and completely kneaded and manipulated, and these massage operations are very much more thorough and complete, than anything possible by hand manipulation. In fact, a very satisfactory substitute for real, active exercise can be obtained thereby.*

Many cases of paralysis will respond to treatment by the means just described. At the same time persevering efforts should be made to redirect the will power to the paralyzed and helpless muscles.

Professor Gross, speaking of "wasting palsy," says,* "The treatment, whatever it may be, should be combined with gentle exercise of the affected parts, to recall them, as it were, to a sense of their duty. They should, in fact, be re-educated by a system of careful training; but to do this to advantage, the efforts must be steadily and perseveringly continued for many months, if not for several

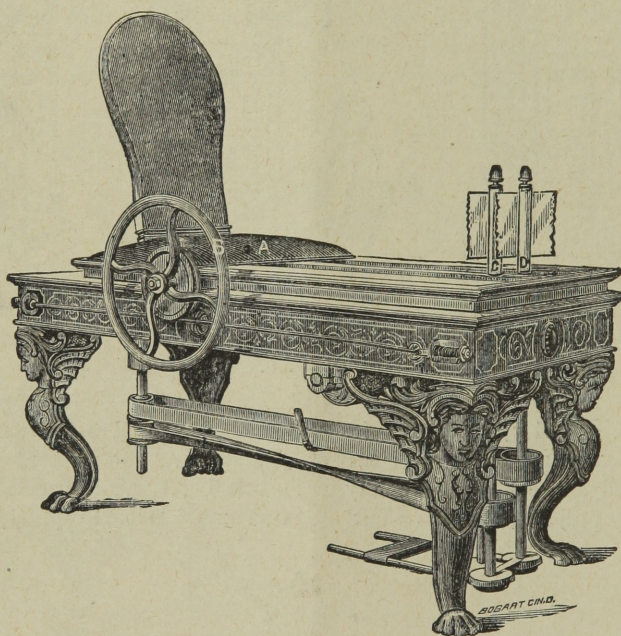


FIG. 5.

years. Conducted in this way great confidence may be entertained of ultimate benefit." Unfortunately, physicians are too apt to relegate all cases of paralysis to the domain of the incurable. It is, however, in cases of infantile paralysis, that the most hope of benefit may be entertained, notwithstanding the fact that nearly all authors regard it as so intractable and hopeless.

Much good may also be done in these infantile cases by efforts to recall the affected parts "to a sense of their duty," by means of properly regulated exercises and massage. This method of treatment has long been known and

used, and is of great utility in fostering and aiding the repeated efforts which nature makes—with varying degrees of success—to reestablish the lost vitality of the affected parts. But the best efforts in this direction *alone*, will usually be productive of a very limited degree of success. The enfeebled, cold, and withered limb, characteristic of infantile paralysis, requires much more than ordinary massage to restore the circulation and increase the amount of blood going to the paralyzed parts. This is accomplished at the Institute by means of a valuable and very important modification of the Junod, or vacuum "boot." (Fig. 6.) The modification here represented consists of

* The ordinary clothing is not removed for treatment by any of these massage or flagellating machines.

* Third edition, vol. i., p. 626.

a double chamber, one surrounding the other; into the outer chamber steam can be passed so as to raise it to any required temperature; from the inner chamber the air can be exhausted so as to create a partial vacuum. This apparatus is absolutely indispensable in the treatment of infantile and allied cases of local paralysis. The enfeebled, cold, and paralyzed limb (arm or leg as the case may be), is placed in the inner chamber of the apparatus, and the steam let into the outer chamber so as to elevate the temperature to about 108° or 110° F. After the limb is thus thoroughly warmed, the air is partially exhausted from the inner chamber. This requires judgment and delicate management. The atmospheric pressure removed should be just enough, and be continued just

long enough, to cause a complete flushing and active congestion of the capillaries, great care being taken to avoid anything like a livid or cupping-glass-like congestion of the limb. After a satisfactory tendency of blood to the part has been secured, the limb is removed, manipulated and kneaded by massage-machinery described in Fig. 2, or passively exercised on the shaking apparatus, Fig. 7. By systematic perseverance in this treatment, the limb grows firmer and stronger, very often resulting in the reëstablishment of the lost power and the functional activity of the part, even in cases that have hitherto been generally considered as quite without the pale of medical or surgical assistance. Chronic, obstinate, and intractable uterine engorgements are also often found to yield

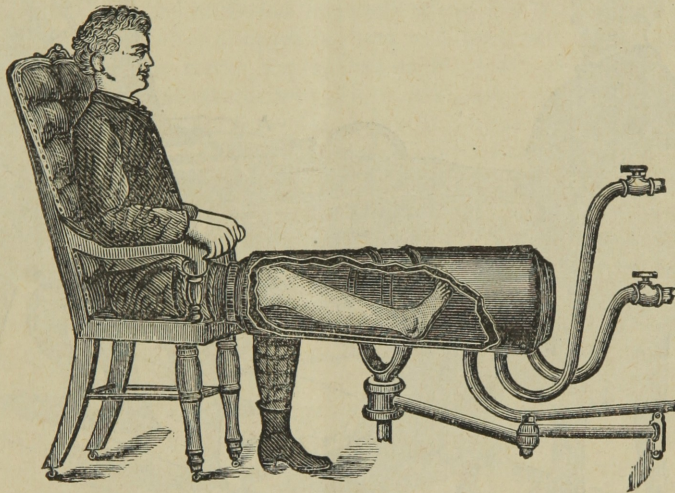


FIG. 6.

to a similar course of treatment. The daily systematic diversion of blood to both lower limbs, produced by the vacuum treatment just described, followed by properly regulated exercises and massage, will often relieve uterine and pelvic engorgements after every device of local treatment has failed.

Fig. 7 represents an apparatus for giving an active, shaking exercise to the limbs. It is intended to do the work of, and is greatly superior to, the oscillating Swedish movement machine. The foot-rest, *B*, is moved very rapidly by a crank motion on one end and a spring suspension on the other. When set in motion the feet and limbs are actively jostled, so that a full equivalent for active exercise is obtained, the capillary circulation in the muscles being especially

stimulated. The same condition is brought about by a similar movement of the hand-rest *A*.

The exercise thus afforded is entirely passive so far as any personal effort or expenditure of nerve-force is required of the patient, but it is fully equivalent to active exercise, so far as its effects on the parts exercised are concerned. It is very useful for a large class of paralytic cases, and especially so in connection with the vacuum treatment just described, Fig. 6. Dyspeptics, and individuals with torpid circulation, cold feet, cold limbs, etc., are also almost invariably relieved by using this machine.

The cases of paralysis, particularly of the infantile variety, that have been greatly benefited by the method of treatment here described, are numbered by the hundreds. We have only

space for one or two, which are typical, and are not more favorable than the average in the results obtained :—

K., a male child, æt. 3 years, was brought to the Institute suffering from infantile palsy, which had occurred suddenly during dentition two years previously. Both legs were withered, cold, and utterly powerless. The gastrocnemius muscle, however, seemed to have sufficient vitality left to remain in a state of permanent contraction sufficient to retract the heel and produce mild *talipes equinus*. The child had never made an attempt to stand, nor could it even occupy a sitting posture without some prop or support. The arms also were greatly affected, though a good power to grasp remained. The general health and intellect seemed remarkably good for one otherwise so generally powerless. The vacuum treatment, combined with proper exercise and massage, was persevered in for twelve months with the most gratifying results. The cold and

lifeless limbs soon began to be habitually warmer, the circulation rapidly improved, and with these favorable changes growth, development, and solidifying of the flesh occurred, till ultimately sufficient power returned to enable the child to stand entirely alone, and now with the usual method of brace supports it can locomote actively on crutches, and will ultimately (if treatment be continued) be able to walk satisfactorily.

Another case: Female child, two years of age, was brought to the Institute with complete infantile paralysis of the left leg, and only partial power of muscles of the thigh of right leg, the muscles below the knee being completely paralyzed. The hands and arms were strong and well developed. The child's method of locomotion was to drag herself along on the hands and abdomen. This condition of things had existed without any improvement for a full year. During a period of six months the vacuum treatment was regularly used, combined with passive exercise and massage. The right leg rapidly manifested an im-

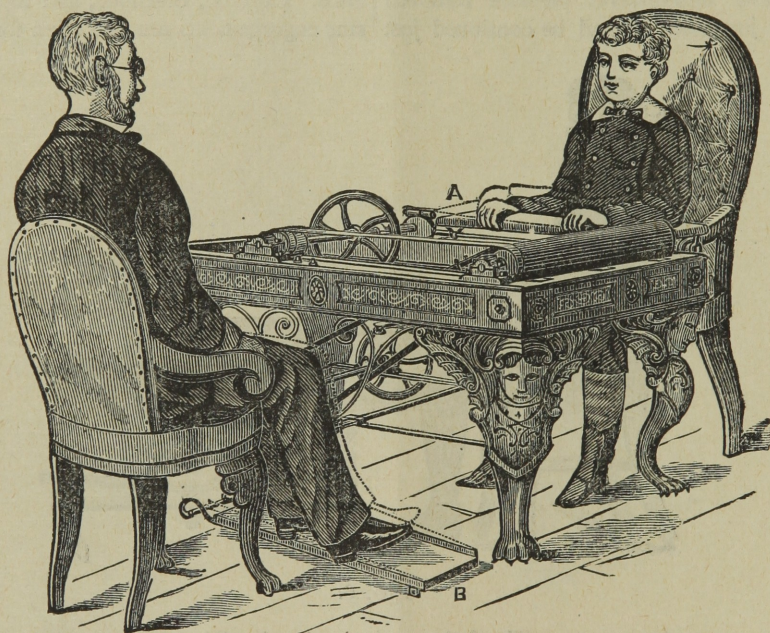


FIG. 7.

proved circulation and development; soon regaining sufficient power to enable her to locomote rapidly on crutches. The left leg more slowly, yet steadily improved, until now, at the end of twelve months, she can walk pretty well, using only a set of well adjusted brace supports for the legs.

The utility of the methods just described, of combining vacuum treatment with massage and systematic movement exercises, is not wholly limited to cases of infantile paralysis. The so-called "hysterical" variety of paralysis is invariably amenable to this method of treatment, and the "rheumatic paralyses" yield with perhaps more certainty than by any other method. The following case illustrates a familiar type:—

Mrs. F. E. F., æt. 37. Legs flexed, stiff, and powerless from repeated rheumatic attacks; power of locomotion entirely gone; had been treated with numberless internal rheumatic remedies, administered by many physicians, but never manifested any improvement. On the contrary, she steadily grew more and more paralyzed and helpless. At the Institute extension braces were used to overcome the muscular contraction. The friction machine (Fig. 2) was freely used upon the limbs, as also the vibrating machine (Fig. 7), electricity, and the vacuum treatment (Fig. 6). By six months' work of this kind the muscular contractions were overcome; the rigid and powerless muscles resumed a good degree of capacity for normal work, and the patient left the Institute walking erect, with braces and a cane.

There are also many cases of peripheral paralysis in adults which are susceptible of

benefit from the same method of treatment. These being essentially "paralyses of conduction," some degree of relief may be hoped for in all cases where there is not an absolutely irreparable nerve lesion. "Recovery occurs principally as the result of the restoration of the conductivity and excitability of the (whole) motor apparatus," and in some instances from a "regeneration of the motor nerves themselves."

If, as Erb (from whom we have just quoted), suggests, we are justifiable in regarding the "motor nerves, with their peripheral terminal apparatus, the muscles," as constituting "one whole and indivisible organ," the line of treatment we have described should be, as I think it is, by far the most satisfactory and successful. The impression thus made upon the muscles is invigorating and profound; and as should be expected from such an impression, it often reacts with decided benefit upon the motor nerves, promoting the return of the lost conductivity, and stimulating repair where repair is needed and yet remains possible.

The extent of the capacity for nerve repair in any given case it is impossible to foretell or foreknow; but it is present to a greater or less degree, and inclines to come into action at some period of the disease in a great many cases, no matter whether the nerve lesion be cerebral, spinal, or peripheral in its location. Even where the diagnosis points very clearly to the most destructive forms of idiopathic structural changes, fruitless attempts are apparently often made for nerve repair, as is evidenced by frequently repeated periods of temporary improvement. Unfortunately, in these cases the original cause is irremovable, and remains continuously in action—hence the result is inevitably unfavorable. When, however, the nerve lesion is essentially traumatic in its origin, whether the result of violence from without, or of accidental injuries occurring from within, such as effusions, congestions, etc., interfering with nerve function, or even provoking actual nerve lesions, the cause not being essentially continuous in its action, although the lesion may have been originally extensive and alarming, there is not only possibility of repair, but with proper treatment there may be a hopeful expectation of it. The remedy usually resorted to in such cases (in fact all cases of paralysis) is electricity. It is the panacea offered by the profession, the laity, and the charlatan. That

it is a proper and useful remedy, if properly applied, there can be no manner of doubt. Yet I believe the results of its use are oftener injurious than useful, not because the remedy is an improper one, but because it is improperly used. Much has been said and written about the kind of electric current appropriate to special cases and special forms of paralysis. It is not, however, so much the kind of electricity, as the method, manner, and, above all, the extent of its use. Nothing can be gotten from electricity in paralytic cases, except such beneficial results as may occur from its stimulating effects. Many cases of paralysis, at some stage of the disease, are ripe for and need stimulus of this kind, and lucky hits are made just sufficiently often to keep the remedy in good repute. Nevertheless, I have seen very many cases where the remedy had been sadly misused and over-used, to the great and lasting detriment of the patient. In the first place, it is often used too early. This mistake is made in a large number of cases where there is a recent lesion that might be said to be in an acute stage. To apply either a galvanic or faradic current to an acutely affected nerve trunk is a therapeutic measure about as sensible as would be the application of a mustard plaster to an irritable ulcer. Unfortunately, there would usually be no pain in the former case so that the patient would be impelled to resist it; but the result is infinitely more disastrous. Secondly, the currents are generally used very much too strong, and the sances are continued too long. That a very mild electrical current, either faradic or galvanic, is often restful and restorative to a healthy, fatigued nerve or muscle, is indisputable. That a strong current, long persisted in, causes and increases fatigue is equally indisputable. In fact, strong electrical currents counteract and lessen the vitality of the parts operated upon, causing the muscles to feel tremulous and exhausted. Yet the almost universal practice seems to be, the greater the paralysis (*i.e.*, the less the vitality) of the parts, the stronger the current used. If the poor, half-atrophied nerves and muscles do not readily respond to an ordinary current, the actual procedure is to push on the current to the utmost and see if it can be forced to do so! The slender hopes of recovery incident to paralytic cases often thus receive their finishing stroke by the indiscriminate and unskilful over-use of electricity. In the hundreds of infan-

tile paralytic cases that are presented for examination at the Institute, I am always best pleased when I am called upon to treat neglected cases, or at least cases in which electricity has not been misused.

The terminal ends of the motor nerves are so closely interwoven with the muscular tissue, that their nutrition and condition, healthful or otherwise, must be in great measure dependent upon these same points in the condition of the muscle itself. Moreover, it is inconceivable but that the terminal ends of the motor nerves must be more delicately organized than the nerve trunks themselves, which, in one sense, are only paths for the transmission and conduction of the nerve currents; now if this be so their condition would be a highly important factor in all processes of repair in the motor nerves themselves, or even in centric lesions at the other end of the nerve tract. To permit the ruin of the motor nerve termini to occur through the atrophy and withering of the paralyzed parts, or to impair (perhaps destroy) them by powerful and long continued electrical currents, is to shut off an important channel whereby the nerve tract may be reached and favorably influenced and assisted in the process of nerve repair. It hence becomes a matter of the greatest moment to prevent the impairment of nutrition, and the progressive atrophy so common in the paralyzed muscles, or even further than this, to restore the organic vital forces of the paralyzed muscles as far as it may be possible to do so.

This is the theory upon which the vacuum and massage combination treatment practised at the Institute is based. Favorable impressions can sometimes be temporarily made, even on hopeless old cases of tabes, sclerosis, etc. Several experimental cases could be cited, but the actual, ultimate results were *nil*, except to indicate and confirm the potency of the treatment, and show that the numerous favorable results in cases susceptible of improvement were not mistaken inferences drawn from accidental coincidences.

Of spinal paralysis the following cases are cited:—

A. R., æt. 41, merchant. Paraplegia of thirteen years' duration. Though he could trace his condition to a pretty serious fall from a scaffold some months before the paraplegia came on. He first presented himself at the Institute in a rolling chair, in which he had wheeled himself about for a dozen years. He was utterly unable to walk, but could with difficulty balance himself and stand a few moments by supporting him-

self with both hands between two chairs, but on making this effort his limbs would quickly begin to tremble, and if he did not immediately sit down he would fall; sensation in both limbs was greatly impaired. He could move the toes imperfectly and flex the leg upon the thigh with difficulty. He had perfect control of the bladder, but irregular and imperfect control of the bowels. Suffered from alternate attacks of diarrhoea and constipation. There was a tender spot for about six inches along the spine in the lumbar region. The general health was good and nutrition perfect. We gave him a very unfavorable prognosis. As he insisted upon treatment, however, we accepted him as a patient. A brace support was applied to spine, and the vacuum treatment, combined with free use of friction and vibratory machines, was diligently persevered in for nine months. As a result, the patient was able to stand without trembling for ten minutes at a time, and could walk about two hundred feet with only light hand-trestle supports.

This is not, *per se*, very much of a result, but in a case so hopeless, it was an unexpected evidence of the favorable effect of this particular method of treatment.

Another case—

F. M., æt. 38, railroad engineer; complete paralysis of lower extremities, with total inability to retain either feces or urine. Motility entirely destroyed, and sensation greatly impaired. This condition was caused by an injury received in a railroad collision about six months before the patient came to Institute; for four months his condition had been at best but stationary, and was so deplorable that we recorded him on our books and received him as "experimental." The treatment was first a brace support to the spine so contrived as to keep it as nearly at perfect rest as possible—after the spine had been thus rested a little time we began with massage, very mild electrical (faradic) currents, and finally, the vacuum treatment, as heretofore described. Result: In two months he began to sit up, in three months he occupied a rolling chair ten to twelve hours each day, in six months he was able to stand on his feet, in nine months he could walk pretty well, and now, at the end of three years, is apparently entirely cured, and for a year past has been daily engaged at office work in his former business.

Mild cases of cerebral paralysis are perhaps more hopeful than those of spinal origin. The following case is offered:—

S. A., æt. 52. Partial paralysis of left side had existed about six months when he presented himself at Institute. Paralysis evidently of cerebral origin. His general health had been poor for several months previous to the attack, which came on suddenly, whilst engaged at his work; for several weeks after the attack there was complete loss of power on the left side, with inability to articulate distinctly. Gradual improvement followed, such as is not unfrequently seen in cerebral cases. At the end of three months, however, his condition became nearly stationary, and remained so till he came under our treatment. At that time he could walk short distances, using two canes, but his movements were jerky and uncertain. The bowels were uniformly constipated, requiring continual resort to laxatives and enemas. Marked and steady improvement kept pace with the treatment at the Institute. The bowels soon acted normally; one cane was discarded at the end of the first month's treatment, and, at the end of three months, when he left us, he habit-

ually took many firm steps without resting upon the other cane. His voice became stronger and nearly natural, and there was in his countenance an unmistakable expression of returning confidence, instead of a weary and haggard look of timidity and despair. He returned to us again, after nine months absence, and reported his condition as having remained about stationary. He was able to remain with us scarcely two months on his last visit, but was again manifestly improved by the treatment.

Of diphtheritic paralysis but few cases have been treated at the Institute. Several of my first cases I dismissed in alarm, on account of the apparent aggravation of the symptoms which seemed to take place when treatment was first begun. It is usual for many of the symptoms attending diphtheritic paralysis to appear to be thus at first aggravated by active massage or even by passive movements. It is therefore necessary in these cases to proceed very slowly, and bring the patient under the full influence of the treatment very gradually. If this is done with due regard to the personal peculiarities likely to appear in different patients, the result will be a satisfactory evidence that the treatment promotes and hastens the recovery.

The many forms of abnormal muscular contractures so often seen by the orthopedic surgeon are almost universally amenable to the treatment we have described as applicable to paralytic cases. Indeed, it may be almost positively said, that no such cases remain wholly unimproved by this method of treatment, whilst a great many of them are absolutely cured. These contractures are exceedingly common in connection with cases of infantile palsy.

All abnormal muscular contractures are to be classed in the broad category of "Disturbances of motility," and may arise not only from the same kind of disturbances that produce paralysis, but actually very often arise from the identical disturbance that has produced the paralysis in the numerous cases in which paralysis and contractures simultaneously appear; thus they may arise from any "points of abnormal excitation," or any "points of inhibition that may occur" anywhere in the motor tract from centre to periphery. To these causes must also be added the whole category of possible reflex motor disturbances, thus making the subject one of the most complicated and interesting in the domain of neural pathology. Though much research has been expended in this direction, we are still compelled to pursue lines of treatment often almost wholly empirical.

Erb asserts that "spasms (which term includes all abnormal muscular contractions) must in all instances be induced by irritation of the motor apparatus," and that such irritation may result either from "increase of the strength of the stimulus," or from "increase of the excitability of the motor apparatus," and that "all spasm may be referred to one or the other of these causes." "So that a motor effect is produced far exceeding the amount of stimulus applied."

This explanation is undoubtedly correct in regard to a great many cases, but it is by no means a satisfactory explanation for *all* cases. I have often been very greatly impressed with the very numerous instances in which the contractions seem to be essentially an imperfect and improper distribution of the normal motor stimulus, rather than any increase in the amount or "strength of stimulus," or "increase of excitability" in any part of the motor tract. I am not aware that this explanation has ever been pointed out or accepted by authors on the subject, but I am so familiar with this phase of it, that I am in the constant habit of basing a more favorable prognosis in all cases of paralysis accompanied by contractures, than if this feature is not present. That there may be numerous instances in which the "stimulus" or motor current (whatever it is), that travels along the motor nerves, should be, as it were, deflected to some portions of the nerve paths more than to others, a real confusion or mis-conduction of nerve current taking place, perhaps, from very slight pathological conditions, is exactly what might often be expected to occur, when we consider the wonderful and almost incomprehensible mixing and decussations of the nerve fibres, which the anatomy of the nervous system reveals. At all events, in my experience it is a well-established clinical fact, that the relief of abnormal muscular contractions by the methods practised at the Institute, results in a corresponding improvement in the paralyzed muscles, and that this improvement is more rapid, more certain, and more definite, than I can get from the same treatment, or from any treatment, in cases where the paralysis is unaccompanied with muscles, or groups of muscles exhibiting abnormal contractions.

CASE I.—Miss E. G., æt. 14. Infantile Paralysis of right leg with contractures of all the flexors of the limb; the extensors were paralyzed, flaccid, and much withered. The leg was constantly drawn back, and kept in a position nearly at right angles with the

thigh. The foot had acquired the position of equinovarus. The disease was of thirteen years duration, the attack having occurred at about one year of age. She had been treated by electricity without perceptible benefit, and had been a great deal of the time wearing extension braces, which were, however, unskillfully constructed, still more unskillfully adjusted, and much of the time neglected. Badly as this part of the treatment had been managed, it, however, had been very useful, as it had prevented complete ankylosis of the knee-joint, which would otherwise probably have taken place. The treatment at the Institute consisted of a better made and well-adjusted extension brace, the vacuum boot, daily followed by use of friction, kneading, and oscillating machines, also faradic electricity. Result of eight months treatment: Contractures cured; very marked increase in size and strength of all the paralyzed extensor muscles; knee straight; equinovarus so far overcome as to permit the foot to be placed flat and properly on the ground when walking in her brace.

CASE II.—C. H., æt. 6 years, male. Infantile paralysis of left leg had existed four and a half years; pale, anæmic child; general health and development poor; leg weak, muscles generally much atrophied; foot everted; left knock-knee; contractures of the gastrocnemius and internal peronei muscles; acquired equinovarus. He had been treated by electricity and internal medicines without any benefit. The treatment at Institute was the same as in preceding case, viz.: vacuum treatment followed by friction, kneading and oscillating machines and electricity; also general tonics. In six months the abnormal muscular contractures were overcome, and coincident therewith was a return of tone and strength to the weaker muscular structures to such a degree as to enable him to walk without either brace or cane.

CASE III.—A. E., female. æt. 18. Infantile paralysis of twelve years duration. Both legs and left arm implicated; entirely unable to walk or even stand; contractures of all the flexors of both legs, with general weakness, atrophy, and paralysis of the extensors; equinovarus of both feet; knees firmly flexed at right angles to thigh, but not ankylosed, the joints being free from disease, and in remarkably good condition for a case of such prolonged contracture. The thighs were drawn forward so that the relative position of the limbs to the body was always that of the sitting posture, even when the patient was in any recumbent position. There was great psoas contraction and extreme lordosis. The muscles of the left arm were much withered, exhibiting a marked tendency to rigidity of the flexors, but no firm contractures such as characterized the flexor muscles of the lower extremities. Reckless tenotomy had been performed. "Everything had been cut." But previously to all this tenotomy, not one particle of effort had been made, *as should always be done*, to improve the condition of the contracted muscles, nor even had there been any effort made or appliance used to secure and retain such additional extension as was, perhaps to a limited extent, made possible by this indiscriminate tendon-cutting. The result was, of course, wretchedly disastrous. The tendons healed, but the muscles were still farther shortened. Tendon-cutting will not overcome muscular contractures, and very transient and imperfect will its results generally be even towards modifying the effects of contractures, unless the condition of the muscle itself be first improved. This was the plan resolutely pursued in treating this case at the Institute. Thus we employed mild faradic currents, the vacuum boot, Fig. 6; prolonged passive movements, Fig. 7; massage, Fig. 2; stretching table (to be hereafter described); the whole co-

incident with the constant wearing of appropriately constructed and carefully managed extension braces. After some months perseverance with this treatment one tendo-Achillis was cut, and also the tendon of the outer hamstring of one leg. No other tenotomy was necessary. Result: The muscular contractures of the arm and legs were practically overcome; the talipes cured so far that the feet could be placed flat on the floor; the psoas contraction was greatly relieved, and the lordosis diminished to less than one-third of the original deformity in this respect; now, at the end of sixteen months, she can stand erect (in her braces) for an hour at a time. She can also locomote short distances pretty well with the aid of crutches or canes.

Nearly allied to the preceding cases, is another important class not strictly paralytic in character, but yet having a similar origin in some occult fault of the nervous system, or some abnormal distribution of nerve-currents, and resulting in ever-varying degrees of weakness in some muscles, and of abnormal muscular contractions in others, so as to produce the several forms of deformity known as club-foot.

In the progress of this deformity there is almost universally brought about some real change of structure in *all the tissues and bones forming the medio-tarsal joint*. Especially is this so in cases originating during intra-uterine life. In these congenital cases there is not only to some extent a lack of development, as recognized by most authors, but also an actual development in perverted directions. This universal distortion of the tissues forming the medio-tarsal joint is not apt to be so evident a feature in cases *acquired* later in life, but in all old and neglected cases this universal distortion is practically always in some degree present, and this fact should not be lost sight of in the treatment.

"It is now a well-understood law of pathology, that if any part of the body, into the composition of which the muscles enter, be maintained in a state of absolute repose, or be habitually kept in one position, so that the origins and insertions of particular muscles are constantly approximated, whilst the points of origin and insertion of other muscles are consequently proportionately separated, a shortened, contracted condition of the first set of muscles, and an elongated, weakened state of the second set of muscles are produced."* This "law of pathology" must be extended further than merely to "parts of the body into the composition of which the muscles enter;" the same law will apply equally to ligamentous tissues;

* Little's article, Holmes's Surg., Am. ed., p. 327.

and even in the bony articulations a somewhat similar change is brought about, for if the bony articulations of joints "be habitually kept in one position," so that the articular surfaces impinge upon each other imperfectly or improperly, a change of shape in the articular facets is inevitable; where the points of pressure are abnormally great, some degree of absorptive alteration takes place, and at points abnormally relieved from pressure a developing effort is made to bring the facets together. Though these changes may be small, they are yet very important. They seem to have been ignored or overlooked by orthopædic surgeons, though, by resections, the saw and the chisel, they have heroically endeavored, with very indifferent success, to correct grave old malformations, when of a more extensive character. Now, it will very readily be perceived that if the numerous articular facets of the bones of the medio-tarsal joint should become gradually modified, or as in congenital cases, should be actually abnormally developed, so as to cause the bones to adjust themselves together in distorted position, the foot will be continually inclined to remain in this distorted position, even though all the forces of muscular contractions are summarily removed, as can be so easily accomplished by tenotomy. The foot, it is true, after tenotomy can generally be quite easily carried into a better position, and for a time quite easily held there. But the foot, left to itself, will continue to retain its habitual distorted position after any amount of tenotomy; the joint will not of itself go into better position, no matter how completely the force of all abnormal contractions is removed. And even though the foot be held for some time in an improved position after tenotomy, unless the articular facets have been first amended, just as soon as the tendons unite, and the old forces of the muscles are applied, "everything is as bad as it was previous to the operation." It is the failure to patiently amend the facets of the bones and also the ligamentous tissues forming the medio-tarsal joint, that causes the many relapses and failures so notoriously occurring in the treatment of club-foot.

Usually, the earlier in life the treatment is begun, and the shorter the duration of the deformity, the easier will be the contest and the better will be the result. Much also will depend upon the kind, extent, and degree of

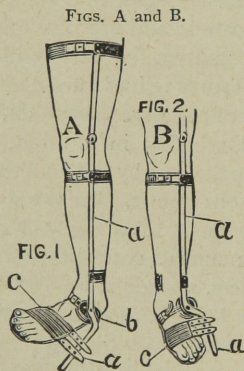
deformity, and the amount of actual change that may have taken place in the structures of the joint.

In the treatment, attention should also be given to the evident perversion of the nerve-forces pertaining to the muscles acting upon the foot. For this purpose electricity is briefly mentioned by a few authors. Massage is scarcely noticed, though Gross incidentally alludes to it as "so important a means of developing the wasted limb." It is of great value for the purpose he indicates, but still more so for the effect it can be made to produce in modifying the abnormal muscular contractions. In many of the more obstinate cases I have found it of the greatest importance to pursue essentially the same line of treatment described on pages 6-8, etc., as applicable to cases of infantile paralysis, viz., kneading the limb, Junod boot, massage, and electricity. Cases of varus, or varus accompanied with some degree of equinus, are by far the most numerous, and are very often congenital. Undoubtedly a few very mild congenital cases of this form of talipes, can be corrected by a simple piece of adhesive plaster, deftly applied, so as to hold the foot in position, or even by simple manipulations by the mother or nurse; for, as every one knows, there is a strong natural tendency for many local congenital defects to undergo spontaneous correction and repair.

A few others, a grade more obstinate and deformed, can be remedied by a simple "well adjusted splint." But the vast majority will be found to require, in addition to the local treatment by massage, etc., various forms of much more complex apparatus, especially when, as often happens, the case has been long neglected or unsuccessfully treated. The obstinacy of some of these cases is surprising, and the ingenuity of the most skilful surgeon will often be taxed to the utmost.

Some of the many ingenious modifications of the well-known Scarpa shoe are usually relied upon to supply the mechanical treatment required. But they very often produce utterly unsatisfactory results. It is always difficult, and often impossible to keep the foot from remaining inverted in any of these forms of apparatus. The shoe is straight, and appears all right in the direction which it maintains upon the foot; but the foot still rolls within the shoe, and nothing is more common than to find the foot additionally deformed, and grievously tortured with huge corns and bunions, caused by the un-

equal and improper points of pressure. The patient is urged and compelled to walk and use the foot in these ill-fitting shoe-braces, under the delusive idea that every step tends to stretch the muscles and tendons and straighten the foot. Nothing could be further from the truth. The already irritated and abnormally contracted muscles and tendons that are thus being imperfectly contended with are, through reflex and other influences, provoked by every step into more obstinate rebellion and more persistent contractions. The use of this shoe, or any of its modifications for the correction of the varus deformity, is an error, though a modification of it may be very useful as a wearing-shoe after the cure has been practically effected. The reason is obvious; a moment's reflection will show that it attempts to do too much. Not only is varus generally accompanied with evident, though various degrees of equinus, but

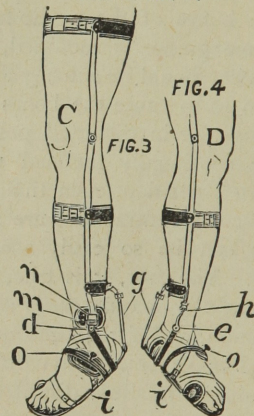


even the apparently pure cases of varus will, when the attempt is made to rotate the foot into position, manifest a distinct tendency for such contraction of the gastrocnemii muscles as to demonstrate a decided equinus element. The foot is, therefore, in all these cases practically distorted in more than one direction; indeed, there are no English words that will define this peculiar distortion better than the perhaps inelegant ones of a *compound twist*. The difficulty of the treatment is still further enhanced by the circumstance that with every degree of undoing of the deformity, there is a variation of the relative direction of the twisted positions which the foot assumes. It is, therefore, for several reasons, much the better way to correct the varus deformity first, without any reference to the equinus that may be present, or that may manifest itself in the progress of the treatment.

The varus alone is easily overcome by a simple brace, such as shown in Figs. A and B; the outer bar, *a*, projects down beyond and along the outer side of the foot, with a pad for counter pressure at *b*; to this is fastened a piece of elastic webbing, *c*, which passes over the inside of the foot and draws it outward. The bar *a* is from time to time bent further outward, and the elastic band gradually tightened till the inversion of the foot is entirely overcome, the foot invariably finally acquiring the position of equinus as shown in Fig. B.

The inversion of the foot is thus easily overcome, the varus is cured, and the case is converted into a simple equinus, in the treatment of which, as so tersely put by Hamilton,* "apparatus can be applied with great advantage, as there is no difficulty in obtaining points of support for the application of forces."

FIGS. C and D.



The apparatus I prefer for the purpose of overcoming the equinus is illustrated in Figs. C and D. C shows the outside of the brace as applied to the leg and foot, and D the inside. The sole of the foot is securely applied to the steel plate, *i* (which is, of course, properly padded beneath the foot), by means of straps and a screw pad adjusted with a steel arch over the instep, as at *o*. There is a joint at *d*, on the outside, and *e* on the inside, of the bars ascending the leg, so as to accommodate any degree of flexion or extension of the foot, which can be perfectly regulated and controlled by the screw-extension apparatus, *g*. There is also a screw-extension at *h*, by which any tendency to inversion of the foot can be regulated. The patient can generally walk with comfort in these braces, and by so doing aids in the stretching

* Surgery, page 464.

of the tendo Achillis and gastrocnemius. No corns, bunions, or bruises are produced by these braces, and rarely is the spasmodic irritability of the gastrocnemius increased by this method of stretching it.

Should this, however, occur as pointed out in a preceding paragraph, the tendon may be cut or another form of brace be applied, as depicted in Fig. E, showing outside of brace as applied, and F the inside of the same. The foot is securely applied to a steel sole, *z*, by means of straps, and a screw pad adjusted with a steel arch over the instep, as at *x*. The leg is held in a flexed position by an adjustable band, *u*, attached to the outer side bar, *s*, above and below the knee. There is a pad for counter pressure above the ankle, at *v*, and a hinge opposite the ankle, below the point, *w*, to permit of flexion and extension of the foot. At the point, *w*, the bar is from time to time bent outward, which resistlessly

FIG. E.

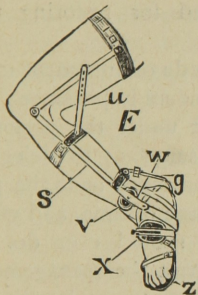
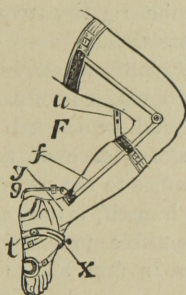


FIG. F.



everts the foot, as the outer bar, *f*, is cut off above the outer ankle, as at *y* (Fig. F). The extension screw, *g*, regulates the equinus. The flexed position of the leg maintained by this brace almost completely removes the spastic action and rigidity of the gastrocnemius, which is always developed in untwisting a varus by the Scarpa shoe, or any of its various modifications or transformations, into a "club-foot stretcher."

The advantages of this method are evident. Cutting of the tibial tendons is never required as the varus is easily overcome. This is a matter of great importance, for, as pointed out by Hamilton,* they never unite, and the power of inverting the foot and elevating the toes is thus forever impaired. There is no such objection to cutting the tendo Achillis or plantar fascia, but this only becomes necessary in old, obstinate, and aggravated cases. The time

occupied in bringing the foot into a normal position permits of the gradual stretching of the abnormally shortened ligaments till they grow longer, whilst the extension is removed from the elongated ligaments till they contract and grow shorter; the contest of opposing forces between the apparatus and the contracting muscles gradually changes the points of pressure on the bones, and favors and produces an amendment and restoration of the articular facets; so that all the components of the joint are amended, the cure is a more perfect one, and relapses are rare. The pains taken with faradization, massage, vacuum treatment, etc., sensibly restores and strengthens the weakened muscles, overcomes spastic contractions, and restores the equilibrium of the muscles acting on the medio-tarsal joint.

In treating calcaneus, the indications are to restore as far as possible the loss of power, which is nearly always evident in the muscles which terminate in the tendo Achillis, and overcome the contractions of the muscles in the front of the leg. The arch of the foot should be kept well pressed down by a steel arch and screw pad surmounting the instep, as represented at *o*, in Fig. C. This arrangement may be either attached to an ordinary shoe brace with steel insole, or a sandal brace as in Fig. C, which will not need the extension screw, *h*, except in the exceedingly rare cases of calcaneo-varus.

The screw extension ratchet, *g*, will need to be replaced by a sufficiently stout elastic band, or "rubber muscle" to elevate the heel and in some measure replace the lost activity of the gastrocnemius.

True valgus is rather a rare deformity, spurious valgus, or flat-foot, is a very common one. The two affections are, moreover, entirely distinct in their origin, though the ultimate result is the production of a deformity having so many points of resemblance that many authors have failed to make any distinction between them, and few or none that I am acquainted with have made the proper one. True valgus originates from precisely the same causes as other kinds of talipes—a different set of muscles acting or failing to act upon the medio-tarsal joint producing a different distortion of the joint. In this case the peronei muscles by abnormal activity, or in consequence of the inactivity of their antagonistic muscles, draw the foot outward. Even a very slight eversion of the foot thus produced results in throwing the weight

* Surgery, page 463.

of the body too much upon the internal malleolus, producing an abnormal strain upon the internal lateral ligament, which soon gives way, and furnishes a facile opportunity for a rapid increase of the eversion deformity thus started. Ultimately, destruction of the plantar arch takes place, partly from the improper manner in which the weight of the body falls upon it, and partly from the spastic action of the muscles upon the tarsal and metatarsal bones.

In spurious valgus, or flat-foot, the original defect often appears to be a mere weakness or relaxation of the ligaments of the mediotarsal joint, permitting the displacement of the tarsal bones, and the consequent destruction of the plantar arch. There is also reason to infer that there is not infrequently an original or congenital lack of precision in the shape and adjustment of the tarsal bones—points where perfection must evidently be present to form a strong and enduring arch.*

When the arch thus gives way, the internal lateral ligament becomes much elongated and weakened, the weight of the body is thrown too much upon it, and, lastly, eversion takes place, producing a distortion in many points similar to, but not identical with, the deformity of true valgus. Thus there is not only a different cause for, but a different sequence in the production of the deformity.

Both true and spurious valgus are easily relieved, but with difficulty cured. Old and neglected cases in adults, though susceptible of very great relief, are wholly incurable. Not so, however, in infancy or during the growing period of life; then very satisfactory results, —frequently positive cures—can be obtained. By long perseverance with proper mechanical apparatus, such as will correct the eversion of the foot, restore and maintain the plantar arch, and prevent further stretching of the internal lateral ligament, we can while the foot is yet growing, assist a normal development to take place. The only cases in which relapses will occur after adult life will be those in which there is a congenital defect and general tendency to universal weakness and relaxation of the ligamentous system.

It is not difficult to overcome such abnormal muscular contractions as are met with in valgus. An ordinary leg brace attached to a shoe with a *properly constructed arched-steel insole*, to maintain and restore the plantar arch,

is the basis of the apparatus needed. A pad to support the inner ankle must be accurately adjusted, and *must be watched and kept so*. The simple lacing of the foot in the shoe will often be sufficient to prevent the turning up of the outer edge of the foot; if this is not sufficient an iron clip attached to the outside of the shoe will effectually prevent any tendency to eversion. This may also be supplemented with an “artificial rubber muscle” attached to and drawing upon the inner margin of the shoe. Most of the points of this form of apparatus for valgus are so old, so well known, and so commonly used that a cut to illustrate them is not needed. But the arched-steel insole is no where insisted upon, yet it is the life of the whole instrument.

Little* speaks of and commends “an elastic horse-hair, India rubber, or felt pad,” but deprecates iron and cork. All these are worthless compared to an arched-steel insole properly shaped and adjusted to the foot in each individual case. It furnishes both the elasticity and the rigidity required for restoring the plantar arch.

“Finally, whatever mode of treatment may be adopted, it is of paramount importance that it should be carried out under the personal superintendence of the surgeon; to delegate this office to the parent or nurse, or to the patient himself, is only a waste of time, and what no sensible practitioner should ever do. I never, in fact, like to intrust the management of a case of club-foot even to an intelligent physician, for there are so many points that demand attention, that unless the greatest possible care is exercised, something will be sure to go wrong, and mar the beauty of the cure.”†

Truer words were never spoken, not only as here made applicable to the management of club-foot, but also as relates to the management of all cases requiring surgico-mechanical treatment.

In the year 1865, Mr. William Adams, of London, declared in one of his lectures that “all the different systems of treatment serve only to impress one with the conviction that lateral curvature of the spine has at the present time no fixed pathology.” A review of many prominent authors who have written of lateral curvature during the twenty years that have elapsed since that date, serves fully to impress one with the conviction that lateral

* Traumatic causes may and often do produce the same result.

* Holmes's Surgery, Am. ed., p. 352.

† Gross's Surgery, vol. ii., 6th ed., p. 1041.

curvature of the spine has even yet no finally *accepted* pathology. This failure to arrive at any fully accepted conclusion, is doubtless partly owing to the circumstance that whilst all authors agree in naming several distinct conditions as causes of lateral curvature, they still adhere, both in the matter of treating it and in the manner of treating of it, to methods that would be appropriate if these curvatures were the disease, instead of being what they really are, but manifestations of several distinct pathological conditions. John Shaw writes pages of elaborate argument to show that the structural changes in the bones of the spinal column are the points of most importance; and that this condition originates from the weight of the body coming to be in various ways, such as "awkward attitudes" and "lounging habits," abnormally thrown upon the oblique articulating processes, which hence gradually become so altered in form that the mal-position remains ultimately fixed and permanent. William Adams elaborately divides lateral curvature into classes, which, however, fail to properly distinguish the cases almost as badly as the "one-idea" notions of the disease, which he so justly condemns. His "essentially constitutional," his "constitutional and local in about equal degrees," and his "essentially local causes acting mechanically," etc., it seems to me do not properly distinguish either the causes of the curvature, or the cases as we see them.

Thus while quite discarding what he calls the muscular theory, he classes his cases arising from "induced or temporary muscular debility" with those arising from "strumous diathesis," "rickets," etc., and mixes them all together in his list of "predisposing causes;" as "proximate causes" he gives numerous specified conditions to be summed up with "the resulting curvature of the spine being produced by long-continued irregular distribution of weight."

Barwell* vigorously advocates the muscular theory, attributing primary dorsal curvatures for the most part to muscular causes, and primary lumbar curvatures for the most part to mechanical causes such as pelvic obliquity, unequal length of the legs, etc.; his argument seeking to find another cause in tight lacing and other methods of constricting the abdomen, is

singularly weak and wanting in facts, whilst the arguments of Adams to the contrary are strong and cogent and well fortified with facts. Gross* says that lateral curvature "is essentially due to irregular muscular contraction," and that "the *causes* which give rise to this irregular action on the part of the muscles are deserving of attentive consideration." He then enumerates six causes: "1st. Affections of the muscles, as hypertrophy, atrophy, inflammation, and spasmodic contraction. 2d. Debility, either general or local. 3d. Obliquity of the pelvis from injury, disease, or malformation of the inferior extremities. 4th. Altered capacity of one side of the chest, causing increased action of the muscles of the opposite side. 5th. Rachitic softening of the bones. 6th. Defective development of the vertebræ."

Of these, the second can scarcely be considered admissible, as local debility as a cause is too vague, and cases of general debility are too common and too well known as constantly occurring without causing the slightest manifestation of lateral curvature or irregular muscular action. Moreover, the instances in which lateral curvature occurs in generally debilitated persons are scarcely more numerous than the instances of its occurrence in persons in all other respects actually vigorous. The causes enumerated, as 3d, 4th, 5th, and 6th, are not satisfactory explanations for irregular muscular action, but could be well grouped under one head as mechanical causes, producing, as Adams formulates it, "long-continued irregular distribution of weight." His first enumerated cause fails to consider sufficiently the important question of the origin of the "affection of the muscles;" he mentions, however, in another paragraph "failure of nerve influence," but dismisses it with the four words here quoted.

Sayre agrees with Barwell in attributing lateral curvature to a muscular origin, but with him errs in ascribing it to the muscular activity of the *serratus magnus* of the convex side, attributing to that muscle an impossible power† of causing the rotation which commonly, but not quite universally, precedes the lateral distortion.

Hamilton,‡ in his usual terse and comprehensive style, says that "in a large proportion

* Curvatures of the Spine, by R. Barwell. Macmillan & Co., London, 1870 and 1877.

* System of Surgery, vol. ii., p. 101, 6th ed. H. C. Lea & Son, 1882.

† As shown by Mr. Fisher, London Lancet, November 7, 1879.

‡ Hamilton's Surgery, p. 448.

of cases the immediate cause is to be sought in a gradual loss of equilibrium between the antagonizing muscles which control the motions of the spinal column," but, I think, errs in the added assertion that "this condition is induced by habitual inclination of the body to one side or the other."

Agnew* attributes the immediate cause to muscular origin, but goes still further towards the root of the matter, carefully pointing out that "central atrophy of the spinal muscles is more common than is generally supposed. Here the seat of the trouble is in the spinal cord, and has the same pathological significance as infantile paralysis; the wasting is gradual, and often supervenes on an attack of some disease of childhood, as diphtheria, whooping-cough, or convulsions." This I believe to be a very near approach to the true pathology of a large proportion of cases of lateral curvature of the spine. These cases are, however, very seldom strictly paralytic. They do not fully manifest such a condition as is seen in the infantile, or so-called spinal paralysis of children. There is not such loss of contractile power in the affected muscles as is seen in true paralysis, but rather a condition of trophic change due to some failure in the supply of that portion of nerve current which maintains the development of the tissues and the vigor of muscular fibre, and which is evidently distinct from the so-called motor currents, which also generally fail to reach the affected muscles in cases of real paralysis. This condition is not, therefore, a true paralysis, but is analogous to a condition often seen in cases of club-foot where certain of the muscles are debilitated by failure of nerve influence, and in this condition are readily overcome by the stronger antagonizing muscles, which, as I have before pointed out, † often seem to be over-supplied with nerve stimulus, apparently receiving those portions of nerve current which fail to find their way to the affected muscles. This condition of unbalanced muscular action of the spinal and thoracic muscular systems ultimately results in producing those osseous structural changes which are so accurately depicted by Shaw and others, and which have been erroneously considered as the disease, instead of but an effect of it. The cases having this central origin manifest muscular structural changes as

a primary result, and osseous structural changes as a secondary result, and should ever be considered as indicating a distinct and different pathological condition from that of cases of lateral curvature "produced by long-continued and irregular distribution of weight."*

Inasmuch, therefore, as lateral curvatures have thus two distinct origins, the simplest and most accurate classification would seem to be, first, cases having a central origin; † and, second, cases having a mechanical origin. Cases having a central origin are by far the most numerous; they are due to some occult fault in the nerve-tract, which causes a failure of some of the normal nervous influences to reach certain portions of the spinal and thoracic systems of muscles. Very nearly all the cases starting with a distortion in the dorsal region as the primary curve have this origin. Secondary and compensatory curves in the cervical and lumbar regions soon follow. The resulting deformity seems capable of progressing to almost every conceivable extent, and is almost universally accompanied with some rotation of the vertebræ. The different points and different degrees of deformity, and the different relative amount of rotation will depend upon, and will be easily explained by, the different extent to which certain sets and different portions of the complicated system of muscles that control the motions of the spinal column are affected or involved.

The curvatures of mechanical origin have

* Admitting that a certain class of cases of lateral curvature have "the same pathological significance as infantile paralysis," a fact of which I have no shadow of doubt, we have an interesting analogy between the great preponderance of curvatures to the right, and a condition very often met with in infantile paralysis. In this disease the (weaker) extensor muscles are notoriously by far the most frequently affected, whilst the stronger and more used antagonizing flexor muscles are nearly always either very much less affected or entirely escape, and are afterwards frequently the recipients of increased nerve currents, so as to actually manifest extraordinary development and more or less extensive spastic contractions. So also in lateral curvature, the right side of the body being the stronger side, both from hereditary causes and habits of more frequent use, the nerve currents are much more frequently sent in that direction and to that side, and it is but reasonable to suppose that the nerve-paths thus become more perfectly developed and more easy of travel. Hence, when any nerve shock, or even any transient nerve disturbance occurs, the weaker (left) side suffers most, the stronger (right) side holds its sway, and the resulting curvature will be to the right, as is so generally seen.

† Dr. Jules Guérin is probably entitled to the credit of having first pointed out the connection between centric nerve lesions and lateral curvature. He strongly advocated the muscular theory, and seems to have met with an extraordinary succession of cases in which the muscles on the convex side were affected with spastic contractions.—Vide "Memoire sur l'Etiologie generale des Deviations laterales de l'Epine par retraction musculaire active, Par Dr. Jules Guérin. Paris, 1840." This is not, however, in accordance with my experience, as I have never met with very marked spastic contractions on the one hand, nor many true palsies on the other.

* Agnew's Surgery, vol. ii., p. 861.

† See pages 12-16 of this reprint.

most frequently the primary curve in the lumbar region, and are usually unattended with rotation of the vertebræ.

The simple classification here suggested will enable us to clear away much of the confusion and conflict of opinion that has prevailed in regard to the treatment of lateral curvature. Cases of the first class, those of central origin, can be best treated by gymnastic exercises, carefully arranged and regulated so as to be adapted to the condition of each patient; but some appropriate mechanical support will generally be found to be an indispensable adjunct, and the best possible hygienic influences must be provided. The best results will not be obtained unless all these measures are skilfully and resolutely persevered in. By these means a practical cure is nearly always obtainable if the patient is treated early and is still within the growing period of life. A complete arrest of the disease, with some diminution of the deformity, can be confidently expected between the twentieth and twenty-fifth years, and a like result is sometimes obtainable up to thirty-five or forty years of age, or even later.

In the treatment of the second class of cases, or those of mechanical origin, the most important procedure is the accurate adjustment of an appropriate mechanical support, or such other mechanical measures as will remove or overcome the mechanical cause. A few of these cases are thus susceptible of absolute cure. Many others can be greatly relieved and improved; and there are but few in which the progress of the deformity cannot be arrested. I am aware that this is giving a prognosis much more favorable than is usually admitted for cases of lateral curvature; such results, however, can be obtained, though only by diligence and perseverance and constant attention. The mere application of a mechanical support, be it ever so excellent, will not suffice unless the patient is kept constantly under the eye of the surgeon, for every mechanical support must be incessantly watched and continually kept up to its work. So, also, with any system of gymnastic exercise; it must be resolutely and efficiently carried out, and from time to time modified as the indications change. If aught less than this is done, dismal failure will continue to be the result of any and every kind of treatment for lateral curvature.

Many ingenious methods have been devised by orthopædic surgeons to provide lateral cur-

vature patients with appropriate gymnastics. These exercises should be conducted in conjunction with an improved position of the spinal column. Barwell's sloping seat is very simple and very useful in certain mild cases. The common apparatus for suspension is also exceedingly useful; but the modification of it shown in Fig. 8, used at the Institute, is much superior to it. The convex portion of the curvature is placed against the pad *B*, while the patient suspends himself by grasping with the hands the bar *E*. The relative position of the pad *B* and bar *E* can be infinitely varied and adjusted so as to suit a patient of any size, and admit of any degree of extension and pressure that may be advisable in each particular case.

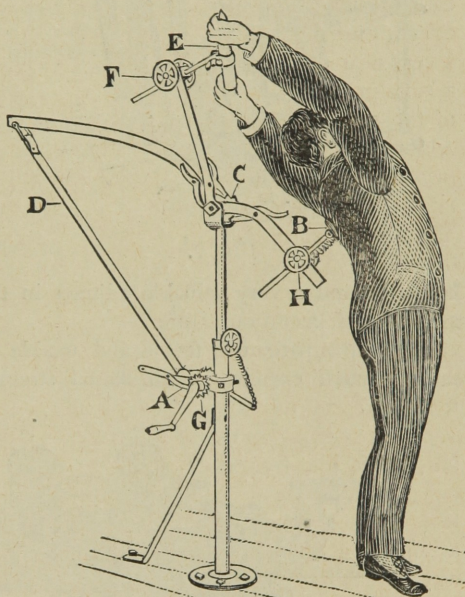


FIG. 8.

In mild cases, with but slightly developed rotation, Barwell's "Respiratory Exercise" will be found useful. In the more marked and stubborn cases, with much rotation, the apparatus used at the Institute is described in Fig. 9. The patient occupies the seat *D*, the back resting against the pad *C*, the arm-pits rest in the crutches *A A*. The adjustable pad *B* rests obliquely against the convex deformity of the thorax, the crutches *A A* are elevated at the same moment that the pad *B* is moved forward, the combined motion giving thorough exercise to every muscle of the back and thorax. It is pleasant exercise to the patient. It stretches the spine and at the same

time pushes the deformity toward a correct position, and gently but thoroughly exercises the muscles of the whole thoracic structure.

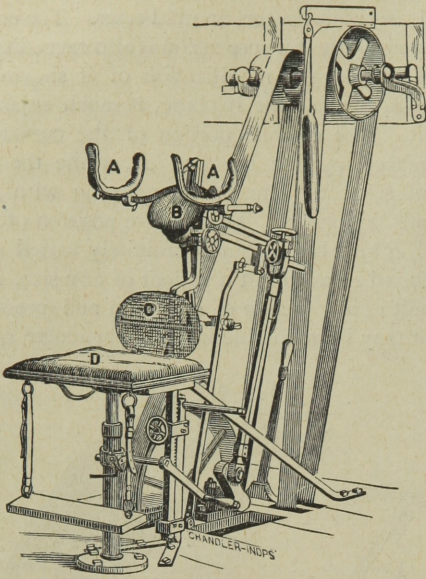


FIG. 9.

It has proved a very valuable adjunct in the treatment of lateral curvature.

Where the patient is feeble and unable to endure much exercise, a horizontal stretch-

ing-table, with adjustable pads for lateral pressure, is indispensable; such an one is depicted in Fig. 10. It is a sort of "rack" which can be used so gently as to give no pain, but so effectively as to produce very favorable changes in many cases too feeble for any method of suspension. Stretching in the horizontal position provokes muscular contractions, and thus becomes really a valuable exercise to the spinal muscles, and if well arranged and regulated, can often be practiced without causing much fatigue. For a similar class of cases, Fig. 11 represents a very ingenious and useful machine, capable of innumerable niceties of adjustment. The patient sits upon the seat *E*, with the head supported on the rest *A*, the sides and back supported with perfect comfort and exactness by the movable pads *C G* and *D*, which can be almost infinitely adjusted to suit each case and each individual peculiarity. The body is supported in such a way as to make pressure directly over the points of curvature. Extension can be made upon the entire spinal column by elevating the head-rest *A* and lowering the seat *E*.

The form of mechanical support to be worn is a matter of great interest and importance. It must be varied and adjusted to suit each individual case, and should be such as can be frequently and readily altered and readjusted

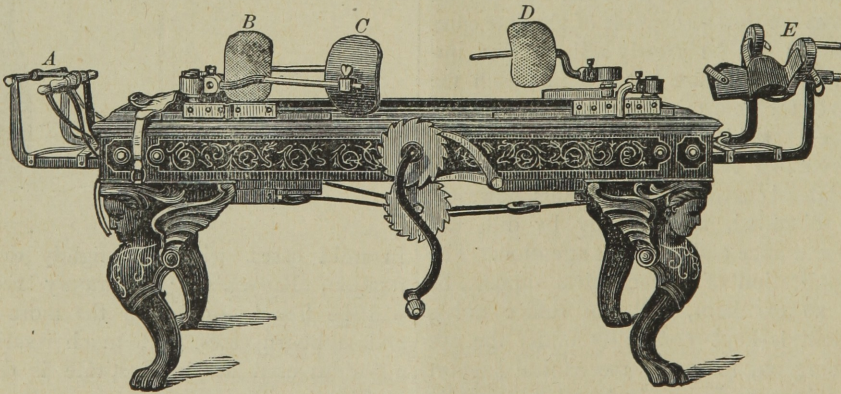


FIG. 10.

as the case progresses and changes under treatment. This must be done in order to secure and retain what is gained and also to maintain progress in the treatment; otherwise no apparatus for spinal support is of much value.

Barwell's elastic rubber belts—his "loin," "oblique," and "spiral bandages"—are ingenious, but can only be useful in the earliest

stages and mildest cases. The plaster-of-Paris jacket and all its substitutes of "poro-felt" or "perforated leather," etc., are alike wholly inapplicable to cases of lateral curvature. They make compression equally in all directions, whereas the indications are for pressure in certain definite and special directions only. They could not be borne or worn at all, if actually

applied so tightly as to really retain the thoracic walls firmly and rigidly in the position which they assume during the suspension usually practised whilst they are being applied. The practical result therefore is, that there is ample room left for the spine to resume and maintain its distorted position in any of these jackets. Yet they are tight enough to so limit and restrict the action of the spinal and thoracic muscles as to seriously interrupt their normal activity and render futile any effort to restore their lost equilibrium or renew their general vigor by exercise, which are points of the utmost importance in the treatment of all cases of central origin.

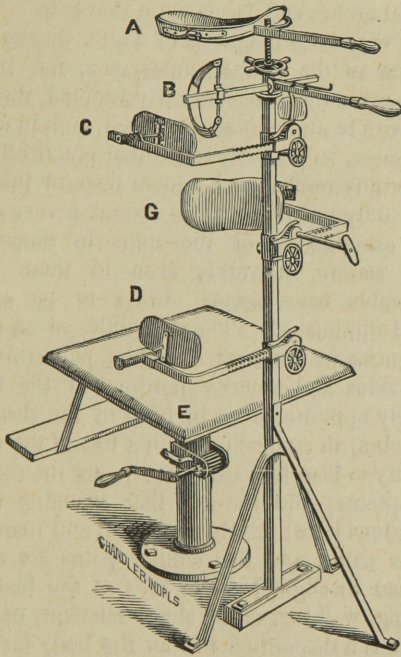


FIG 11.

The whole brood of "jackets" should therefore be utterly and absolutely discarded in all cases of lateral curvature; besides being heavy, clumsy, and every way uncomfortable, they are always just tight enough for injury and just too loose for utility. Pressure is permissible at a few points only, and these points of pressure must be such as will tend to correct the deformity by pressing, drawing, and holding the body in a more correct position.

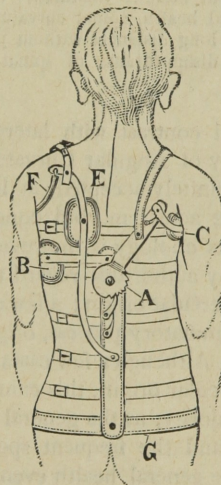
The common form of steel spinal instrument, with adjustable spring pads, or bearings, at the proper points, will often be sufficient. A ratchet

joint, *A*, in the steel back strap, Fig. 12, is sometimes more efficacious in cases where the tendency to rotation is slight or absent. Cases originating from pelvic obliquity will always need a leg attachment to the brace here outlined. The few cases originating from unequal length of the legs, must be corrected by a leg-brace extension or some form of extension to the shoe.

One hundred and sixty-four cases of Lateral Curvature were treated during the past five years, from which I quote three:—

CASE I.—Miss B. C., age 15 years. Lateral curvature with marked rotation. Has existed five years. Had been treated with plaster jacket for two years before coming under my care; had also worn a corset crutch brace for a considerable time, all without improvement, in fact, the deformity had steadily increased, and the general health was becoming more and more impaired.

FIG. 12.



In Fig. 12 is depicted a brace for Lateral Curvature. *C* is a padded inverted steel arch, passing under the arm-pit, regulated by the ratchet joint, *A*, so as to elevate the low shoulder. *B* and *E* are adjustable pads, pressing upon the projecting points, of the elevated side and shoulder, at points over the greatest convexity of curvature. *G* is a steel band fitted around the hips to fix and support the apparatus. The marks [-] are merely elastic tape straps holding in place an apron of open meshed cloth fitting across the chest and abdomen.

I commenced treating patient in May, 1885, applied ratchet brace, Fig. 12, with side supports and leg attachment. After this had been worn four months, a two-bar brace with a crutch extension under low shoulder and same leg attachment was used. In conjunction with the wearing of these braces, the patient took daily exercises on upright stretcher, Fig. 8, and apparatus Fig. 9, sometimes also the horizontal table stretcher, Fig. 10, was used. Dry cupping, electricity and massage were also used as stimulants to the debilitated muscles. Occasionally some general tonics were administered.

Result of six months' treatment as above: General health greatly improved; deflection of spine and

prominence of scapula reduced one-half; increase of stature one inch. General appearance of thorax vastly improved. This patient is still undergoing treatment, and is still improving, especially in general health and vigor.

CASE II.—Miss I. C., age 15 years. Lateral curvature of twelve months' duration. No previous treatment. Ratchet brace, Fig. 12, with side attachments for day use. Two-bar brace for night use. Daily exercises on Figs. 8 and 9, as in preceding case; also dry cupping, massage, electricity, and general tonics. Result of six months' treatment: great improvement in general health, with almost complete obliteration of curvature.

CASE III.—Miss B., age 12 years. Lateral curvature and spinal irritation. Had existed five years when I first saw her. The general health was much impaired, and there was marked tenderness upon slight pressure or percussion in dorsal region. Curvature well defined. Inability to stand long, or walk any distance without suffering much pain and fatigue.

Treatment: Lateral curvature brace, Fig. 12, also electricity, and careful cupping along the spine, with mild counter-irritation, and daily use of apparatus for spinal support, Fig. 11; also appropriate tonics and constitutional remedies.

Result of four months' treatment: Great improvement in general health, spinal curvature diminished, ability to walk long distances without pain or fatigue, and complete disappearance of spinal tenderness in dorsal region.

In marked contrast with lateral curvature, the pathology of Angular Curvature is universally and definitely accepted, at least as far as relates to the actual morbid condition of the vertebra. Its etiology is, however, a disputed point. Many authorities regard the disease as always of tubercular origin; a few others ascribe it to an inflammatory process, originating from traumatism. Although a few cases are undoubtedly of tubercular origin, this cannot be true of the great majority, as the general curability of the disease and the frequent spontaneous recovery of the general health even in neglected cases, *albeit* with great deformities, is utterly at variance with clinical experience in regard to tubercular disease in all other cases.

Moreover, I have made diligent search for the "bacilli tuberculosis" in the pus from five cases of Pott's disease, complicated with abscess, finding them in but one, and that was a case in which death ensued in a public hospital.

From some cause an inflammatory process is established, which results in destruction and absorption of certain of the intervertebral cartilages, and the more or less complete destruction of the spongy cancellated bodies of the adjoining vertebra, whilst the harder posterior portions of the vertebra remain intact.

The weight of the body speedily causes a forward tilt, the spines become more promi-

nent at the diseased point, and a more or less acute angular curvature results. The angular projection of the spine is very generally directly backward; cases, however, are occasionally seen in which the body is also strongly thrown over to one side or the other, thus making a compound forward and lateral curvature, by which the spinal column is sometimes so twisted as not only to make one shoulder higher than the other, but also anterior to the other, so that in walking there is an awkward appearance, as though the thorax was progressing in some degree sidewise. This is caused by one side of some of the vertebral bodies becoming more rapidly broken down than the other, together with a necrosis and giving way of some of the spinal arches and facets upon that side.

A very early diagnosis of Pott's disease is a matter of the utmost importance, for, if the proper treatment is very early adopted, the disease can be almost certainly cured, and, in many instances, so perfectly cured that practically no deformity results, such a mere trace of the disease only remaining as to require a very careful examination of the spine to detect it. The stature, however, even in these most favorable cases seems always to be somewhat diminished. The difficulties of an early diagnosis are not great. Aching pains through the sides and anterior portions of the body nearly opposite to or in front of the diseased vertebra, in connection with a loss of the usual ability to lean forward or stoop, are the earliest symptoms; and the fact that assuming these positions is awkwardly performed and increases these pains, and that similar pains are occasioned by slight jerks or jolts of the body in riding, walking, or by slight missteps, or that there is a disposition to lean the body forward to seek for support from the hands, or even to rest the chin against a chair, or table, are points of such universal occurrence that they can scarcely be overlooked, and of such positive significance as to demand an immediate and careful examination of the spine for the earliest traces of disease or commencing deformity. If as yet no further evidence of Pott's disease can be positively discovered, at least perpetual watchfulness should be instituted, and repeated examinations should be made, so that not one hour may be lost in applying the proper remedy should vertebral disease become manifest.

The pains just spoken of are peripheral mani-

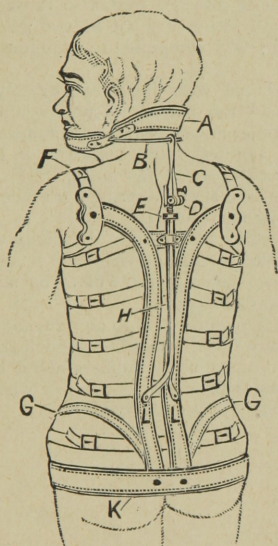
festations of irritation near the roots of the spinal nerves as they emerge from the spinal foramen of the diseased vertebra. Unfortunately they are generally accounted for and covered under the broad mantle of neuralgia, rheumatism, etc.; but the fact of their distinct increase by exercise, stooping, missteps, etc., or their distinct connection with an impaired motion of the spine, will generally enable the surgeon to decide upon their origin, and eliminate the almost universal error as to their alleged neuralgic or rheumatic origin. Thus a positive diagnosis can very often be made in the very incipency of the disease and treatment be instituted before any angular deformity

affected from the pain manifested at the peripheral extremities of the spinal nerves.

In the matter of treatment, constitutional remedies, general or special tonics should not be omitted, and a few neglected cases may occasionally require for a time absolute rest in the recumbent position; but the grand remedy either early or late in the disease, is such mechanical support as will effectually relieve the bodies of the vertebra of a large part of the weight that usually falls upon them. Several devices are well known and frequently used for this purpose; perhaps the most commonly used, and worst of all, is the "plaster jacket" and its substitutes of perforated leather and felt. These are undoubtedly improvements upon the old crutch apparatus, by which futile attempts were made to hold up the spine by pushing up the shoulders, but for many evident reasons they prove quite as unsatisfactory in the treatment of angular curvature as they are in the treatment of lateral curvature.*

A steel splint, *LL*, Fig. 13, applied to the spine, with nicely adjusted pads, *H*, one on each side of the diseased vertebra, and straps, *F*, to hold the thorax and shoulders back and prevent the weight falling upon the anterior portions of the vertebral bodies, is perhaps the very best arrangement. The solid vertebral facets thus become the fulcrum and resting point for the weight of the body, and the steel splints are the levers to hold it up. This apparatus is light and effective, is not oppressive to wear in warm weather, is easily removed whenever changing and renewal of the clothing is necessary, and above all does not interfere with the respiratory movements of the thorax. It supports the spine almost perfectly, when properly adjusted, but, like all other orthopædic appliances, requires continual watching, and occasional re-adjusting and tightening, in order to get the best results. These little attentions, however, are easily fulfilled, and require but little time after the brace is once properly fitted. Where a support for the head is required, the old-fashioned "jury mast" device—an unsightly, rickety concern, extending over the top of the head like a gallows, to which the head is literally swung—should be utterly discarded, and the steady "head rest," depicted in Fig. 13, substituted therefor. The head rest is infinitely less conspicuous, permits of the wearing of an ordinary head dress,—any form of hat or bonnet,—and, above all, performs its functions

FIG. 13.



In Fig. 13 is depicted a brace for Angular Curvature. *K* and *G* are the steel hip bands on which the brace rests. *LL* represent the steel splint supports for the spine. *H* the padded points either side of the diseased vertebra. *F* the straps to hold the shoulders back. *A* represents the head rest, and *B* and *C* the steel rods by which it is attached to the other portions of the brace. *E* and *D* are screw arrangements for elevating and regulating the height and pitch of the head rest. The whole is upon an ingenious double joint, which admits both of rotation and rocking the head backward and forward. The marks [-] are merely elastic tape straps, holding an apron of open meshed cloth firmly against the chest and abdomen.

is manifested. There is quite universally a clear and positive manifestation of the above symptoms for a considerable time before the occurrence of the angular deformity, the elevation of the shoulder and the peculiar gait, so graphically depicted and described by nearly all surgical authors as important points in making the diagnosis. A good knowledge of the anatomy and distribution of the spinal nerves will almost enable the surgeon to locate the vertebra

* See page 20 of this reprint.

perfectly and well, which the "jury-mast,"—literally a gallows—does not do. This head rest has been known and used for many years past, and it is simply amazing that prominent surgeons should have so long neglected to recognize its merits, or even to become acquainted with its existence.

One hundred and twenty-nine cases of Pott's Disease were recorded on our books during the past five years, from these I quote three:—

CASE I.—H. I., æt. 18; male. Pott's disease of ten years' duration, involving lower dorsal and upper lumbar vertebra, with abscesses discharging in sacral region, and also on outer aspect of thigh. General health very bad. Previous to coming under our care had worn plaster jackets, and later, a badly adjusted steel brace, obtained from an instrument maker; had derived no benefit from either, and the disease was steadily progressing.

Our treatment has consisted of an accurately adjusted steel brace firmly fixed at pelvis, with light, steel splints extending to the shoulders, thus comfortably supporting the diseased vertebra at all times (substantially, Fig. 13, without the head-rest). *Daily attention is given this apparatus*, so that it may be kept always supporting the diseased vertebra. General tonics, cod-liver oil, iron, etc., exhibited. This patient is now walking about, and is slowly but manifestly improving, though the prognosis is considered uncertain on account of possible tuberculosis.

He is an intelligent and refined young gentleman, and could not be induced to submit again to the "Plaster-Jacket" torture.

CASE II.—Mr. C's son, æt. 11, German. Pott's disease, apparently originating from a severe fall, had existed four years when brought to the Institute; the deformity was at middle dorsal region, but there were

both psoas and lumbar abscesses. Patient was confined to bed with severe cough and great emaciation. His general condition was deplorable.

A nicely-adjusted steel brace, Fig. 13, without head-rest, was applied to the spine, and a general tonic treatment adopted. Patient soon began to improve, and after three months was able to sit up a few hours each day, always wearing his brace for spinal support. At the end of six months the cough had nearly ceased, the sinuses had all closed but one, and he was able to sit up and be about all day. At the end of one year cough had ceased entirely, the abscesses were all healed, and ankylosis of the diseased vertebrae was progressing satisfactorily. Now, at the end of eighteen months, he is actually performing light work. Is yet wearing brace, which it will, perhaps, be advisable for him to do for at least a year to come.

CASE III.—Mrs. F. D., æt. 32; married; and mother of four children. I detected incipient vertebral disease at junction of cervical and dorsal vertebrae. Patient had for several months suffered much from headache and pain at diseased part, also throughout neck and throat, with sense of great fatigue when holding the head erect; was compelled to abandon her household duties.

I applied brace with head-rest, exactly Fig. 13. About this time the patient became again pregnant she wore the brace and head-rest with comfort throughout gestation, and was safely delivered in November, 1885. Has partly nursed her child, which is healthy and vigorous. She is still wearing the brace and head-rest, and is now nearly well.

There is a small but distinct deformity with ankylosis between the seventh cervical and first dorsal vertebra, but it is so inconsiderable as to be unnoticeable without special examination.

The patient frequently goes to church, and has thrice been to theatre wearing this brace, which she adroitly renders less conspicuous by mufflers about the neck—a great contrast with anything possible when wearing an old-fashioned "jury-mast" gallows.

